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HiTec 2024 Workshop Track

Prompt Engineering Workshop

Interacting with Generative AI (Gen AI) Tools

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AGENDA

- ❖ Introductions
- ❖ Review Gen AI Fundamentals and Tools
- ❖ Review Gen AI Prompt Engineering Concepts
- ❖ Limitations of Gen AI tools (free and paid subscription)
- ❖ Discuss AI Ethics and Implications
- ❖ Discuss Gen AI Use Cases for Higher Education
- ❖ Hands-on Activities
 - Text to Text Prompts
 - Text to Images Prompts
 - Text to Audio Prompts
 - Text to Video Prompts
 - Your Own Use Case for Classroom
- ❖ Open Discussion

INTRODUCTIONS

Workshop Leads:

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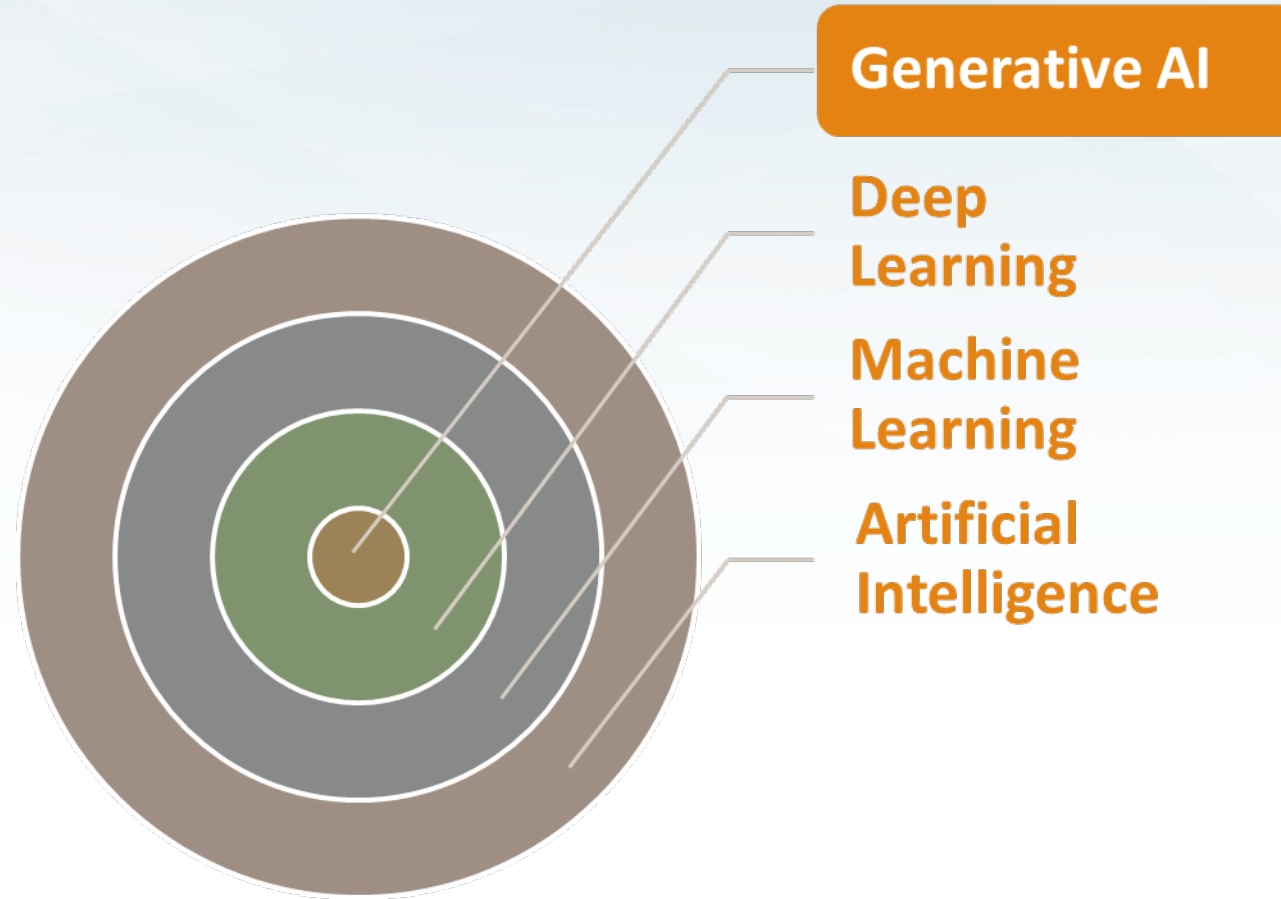
Workshop Participants:

13 members registered from 11 different institutions -

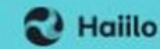
- 7 Administrators
- 5 Faculty
- 1 Student

Review Gen AI Fundamentals and Tools

What is Gen AI?



What is Gen AI?



Generative AI is a technology that allows machines to create content on their own based on input data. It uses algorithms and models that learn patterns from large sets of data, allowing it to generate new content that is similar to the input data.

Frequently Used Terms (1 of 2)

GPT (Generative Pre-trained Transformer)

GPT is a type of language model that uses deep learning techniques to generate human-like text. It consists of several layers of transformers, which are neural network components specifically designed for handling sequential data like text.

Embeddings:

Embeddings are numerical representations of words or tokens in a continuous vector space. They capture semantic meanings, allowing the model to understand relationships between words. In ChatGPT, embeddings help in converting tokens into a format that the neural network can process.

Tokens:

Tokens are the pieces into which text is divided for processing by the model. They can be as short as one character or as long as one word or more. For example, the sentence "ChatGPT is great!" might be tokenized into ["Chat", "GPT", " is", " great", "!"]. The model processes text in terms of tokens.

Text Generation Models:

These models are designed to generate coherent and contextually relevant text based on the input they receive. GPT models, generates text by predicting the next token in a sequence, given all the previous tokens.

Frequently Used Terms (2 of 2)

Prompt:

A prompt is the initial input or question given to the GPT model. The model generates responses based on this prompt. Crafting effective prompts is crucial for obtaining useful and accurate responses.

Temperature:

Temperature is a parameter that controls the randomness of the text generated by the model. A lower temperature makes the output more focused and deterministic, while a higher temperature increases diversity and creativity.

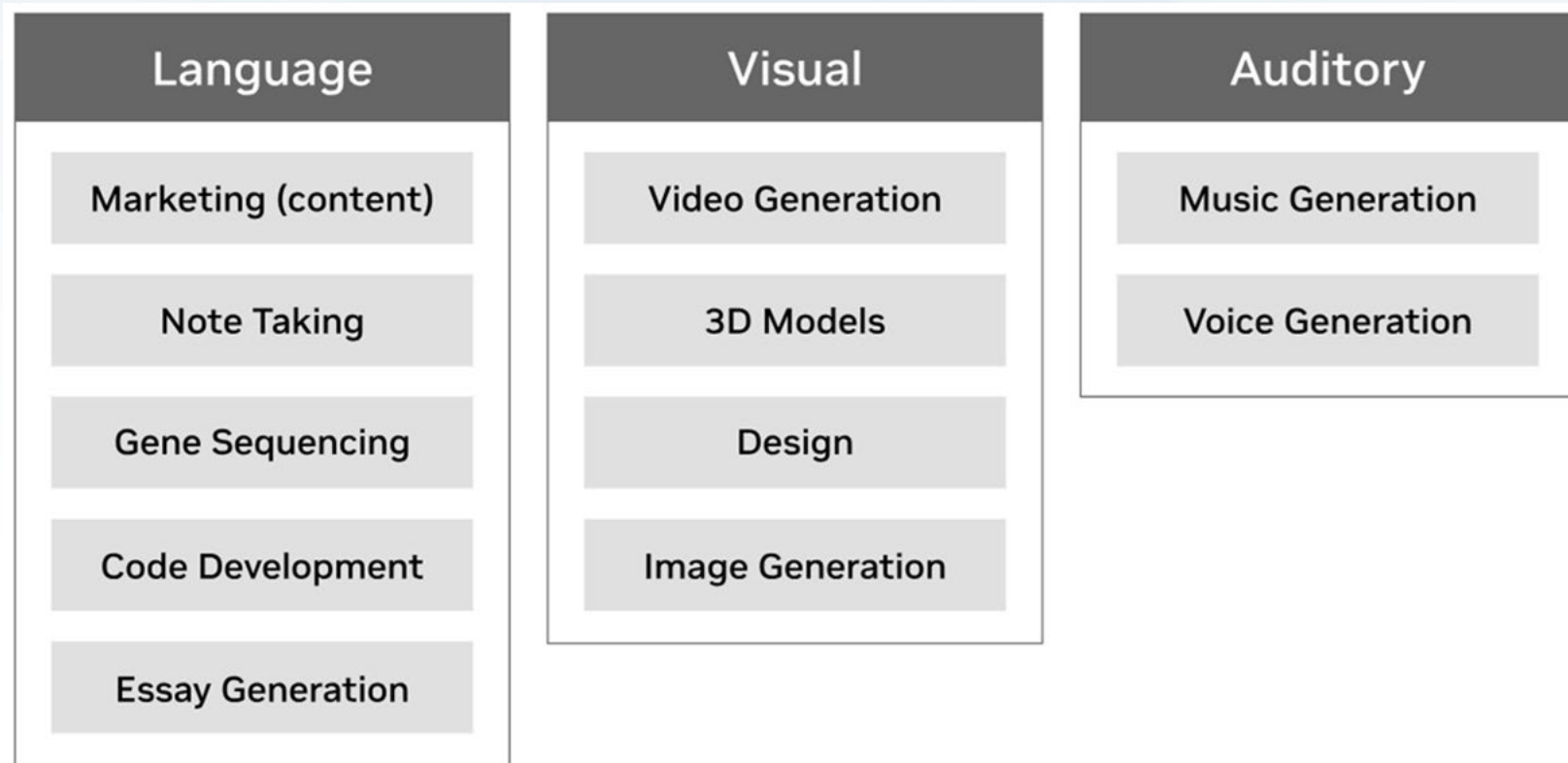
Context:

Context refers to the preceding conversation or text that informs the model's current response. Maintaining context is essential for coherent and relevant interactions.

Parameters:

In Gen AI parameters are variables within a model that determine how it behaves and the results it produces. They are similar to control settings, like knobs and switches, that the model can adjust to improve its performance. Parameters are learned automatically during training, when the model is exposed to different inputs and adjusts its parameters to reduce prediction errors.

Most Common Gen AI Use Cases



Gen AI Tools by Category

Text to Text

- Chat GPT
- Google Gemini
- Claude
- Perplexity

Text to Audio

- Stableaudio
- Suno
- Murf
- Soundful

Text to Images

- Google Gemini
- Microsoft Co-pilot / Dall-E
- Runway ML

Text to Video

- Invideo
- Runway ML
- Sora
- Steve.ai
- Pictory

Review Gen AI Prompt Engineering Concepts

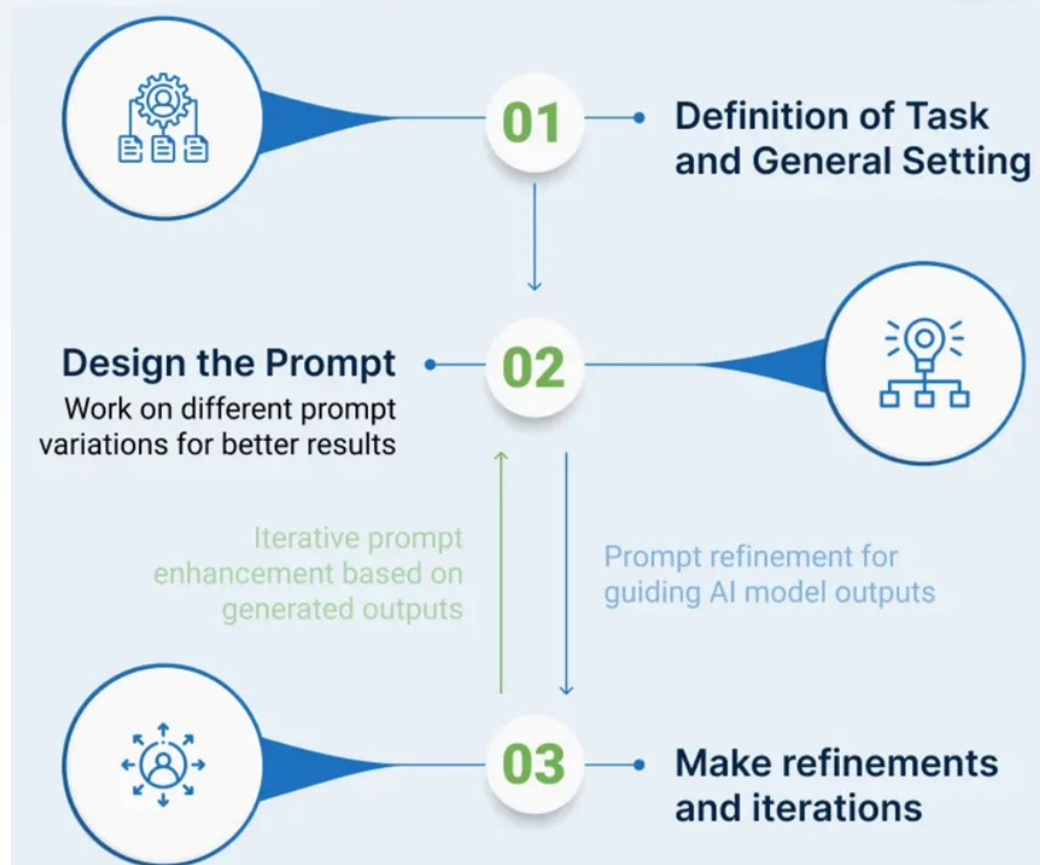
What is Prompt Engineering?

- Prompt Engineering is the practice of **creating and constructing** inputs for Generative AI tools that will **produce optimal outputs** from AI Language Learning Models (LLM).
- Prompt engineering skills help to better understand the **capabilities and limitations** of large language models (LLMs).
- Prompt engineering is not just about designing and developing prompts. It encompasses a wide range of **skills and techniques that are useful for interacting** and developing with LLMs. It's an important skill to interface, build with, and understand capabilities of LLMs.
- You can use prompt engineering to improve safety of LLMs and build new capabilities like **augmenting LLMs** with domain knowledge and external tools.

What is Prompt Engineering?

- Goal – **Better inputs** into a generative AI model can make for **better results**.
- A prompt tells the LLM what you want it to do and provides enough context for it to understand your request. It's like **setting the parameters** for the LLM's creative engine.
- Prompt engineering is a fascinating field that's unlocking the full potential of LLMs. It's like **speaking the AI's language** and helping it understand your wishes clearly.

What is Prompt Engineering Process?



Sample Prompt and Response

Sample Prompt: “What is prompt engineering?”

ChatGPT Response:

- Prompt engineering refers to the process of designing and refining the input prompts given to a natural language processing (NLP) model to achieve desired outputs. It involves crafting instructions or queries in a way that elicits the desired information or behavior from the model. This concept is often discussed in the context of working with language models like GPT (Generative Pre-trained Transformer) models, including GPT-3.
- The goal of prompt engineering is to influence the model's behavior or output by providing instructions in a specific way. This can involve adjusting the wording, tone, or structure of prompts to achieve better results. Prompt engineering is commonly used to fine-tune the performance of a language model for a particular task or domain.

Sample Prompt and Response

Sample Prompt: “What is prompt engineering?”

Gemini Response:

- Prompt engineering is essentially the art of crafting the perfect instructions for a large language model (LLM) like me! It's the process of designing and refining the input text, or "prompt," that you give to an LLM to guide it towards generating the desired output. Think of it like writing a detailed recipe for the AI to follow, where the ingredients are your words and the dish is the outcome you want.
- LLMs are powerful, but need guidance: Even though LLMs can process and generate amazing text, they need clear instructions to avoid going off on tangents or misunderstanding your intent. That's where prompts come in.
- Crafting the perfect prompt: It's not just about throwing words at the model. A good prompt is well-structured, uses the right language style, and provides relevant context. You can include examples, desired tone, even specific formats like bullet points.
- More than just text: Prompts can go beyond plain text! You can incorporate images, code, or even other AI outputs to further guide the LLM and achieve more complex results.
- Benefits go beyond text generation: Prompt engineering isn't just for writing stories or poems. It's being used to fine-tune LLMs for various tasks like question answering, code generation, image editing, and even robotic control.

How to get better results from prompt? (1 of 2)

1. Write Clear Instructions

- The less the model has to guess what you want, the more likely you'll get the results.
- Include details in your query to get more relevant responses.
- Use delimiters to clearly indicate distinct parts of the input.

2. Provide reference text

3. Provide a model with trusted information that is relevant to the current query, then we can instruct the model to use the provided information to compose its answer.

4. Split complex tasks into simpler subtasks

5. Give the model time to 'think'

- Instruct the model to work out own solution before rushing to a conclusion

How to get better results from prompt? (2 of 2)

6. Use external tools

- Compensate for the weaknesses of the model by feeding it the outputs of other tools. For example, a text retrieval system (sometimes called RAG or retrieval augmented generation) can tell the model about relevant documents. A code execution engine like OpenAI's Code Interpreter can help the model do math and run code. If a task can be done more reliably or efficiently by a tool rather than by a language model, offload it to get the best of both.

Elements of Prompt

A prompt contains any of the following elements:

- **Instruction** - a specific task or instruction you want the model to perform
- **Persona** - identity or role for specific task
- **Context** - external information or additional context that can steer the model to better responses
- **Input Data** - the input or question that we are interested to find a response for, including exemplar and tone
- **Output Indicator** - the type or format of the output.

Prompt Types

There are a few different prompt types. Choosing the most effective prompt type depends on the specific task, model capabilities, and desired outcome. By understanding the technical nuances of each type, you can become a skilled prompt engineer and unlock the full potential of these powerful language models.

Prompt Type – Zero-shot Prompting

Definition: Instructions with minimal or no contextual information or examples.

Technical Aspects:

- Relies heavily on the model's pre-trained knowledge and capabilities.
- Works best for simple tasks and factual queries.
- Often uses imperative commands or open-ended questions.

Example:

Classify the <text> into neutral, negative or positive.

Text: I do not like Spinach.

Output: Negative

Prompt Type – Few-shot Prompting

Definition: Provides a few relevant examples to guide the model towards the desired output.

Technical Aspects:

- Utilizes one-shot learning principles to adapt the model's response based on limited examples.
- Effective for tasks requiring specific style or domain knowledge.
- Typically includes examples followed by instructions or questions.

Example:

Translate the following English sentences into French:

Text: Hello, how are you?
 The cat is on the table.
 What time is it?

Output: 1. Bonjour, comment ça va ?
 2. Le chat est sur la table.
 3. Quelle heure est-il ?

Prompt Type – Completion Prompting

Definition: These prompts involve completing a given sentence or filling in the blanks.

Technical Aspects:

- Involve masked language modeling tasks where certain tokens are replaced with placeholders, requiring the model to predict or fill in the missing parts.

Example:

"The capital city of France is ____."

Prompt Type – Problem-Solving Prompting

Definition: These prompts involve asking the model to solve a problem or provide a solution.

Technical Aspects:

- Design prompts as problem statements or questions that require the model to generate solutions.
- Utilize conditional prompts to guide the model towards proposing feasible answers.

Example:

"Propose effective measures to reduce air pollution in urban areas."

Prompt Type – Chain-of-thought Prompting (CoT)

Definition: Breaks down complex tasks into intermediate reasoning steps, similar to human thought processes.

Technical Aspects:

- Employs multiple prompts with logical progression, simulating internal reasoning steps.
- Improves performance in tasks requiring multi-step reasoning and justification.
- Often uses numbered prompts with explicit reasoning and justifications.

Example:

"1. Given the equation $y = mx + b$, what is the slope? 2. Differentiate y with respect to x . 3. The coefficient of x in the resulting equation is the slope."

Prompt Type – In-context Prompting

Definition: Supplies additional information relevant to the task at hand, narrowing down the possible outputs.

Technical Aspects:

- Augments the prompt with contextual details like relevant documents, conversations, or specific settings.
- Useful for tasks requiring disambiguation or grounding in a specific context.
- Can include background information, prior interactions, or situational details.

Example:

"After discussing the patient's symptoms, the doctor concluded... (Continue the medical report based on the provided information)."

Prompt Type – Creative Prompting

Definition: Provides specific instructions and constraints to guide the model's creative generation.

Technical Aspects:

- Combines stylistic elements, genre specifications, or thematic constraints with the desired creative task.
- Useful for generating various creative text formats like poems, scripts, musical pieces, etc.
- Often includes detailed descriptions of desired style, tone, or thematic elements.

Example:

"Write a children's story about a robot who dreams of learning to fly, incorporating humor and a sense of wonder."

Prompt Type – Role-Based (Persona) Prompting

Definition: These prompts assign a specific role to the model, influencing its perspective in the response.

Technical Aspects:

- Embed role-specific information or personas into prompts to guide the model's perspective.
- Use conditional statements or context flags to signal the role the model should adopt in generating responses.

Example:

“Pretend you are a historian. Describe the impact of the Industrial Revolution on society in the 19th century.”

Limitations of Gen AI tools (free and paid subscription)

Limitations of Gen AI tools (cost based)

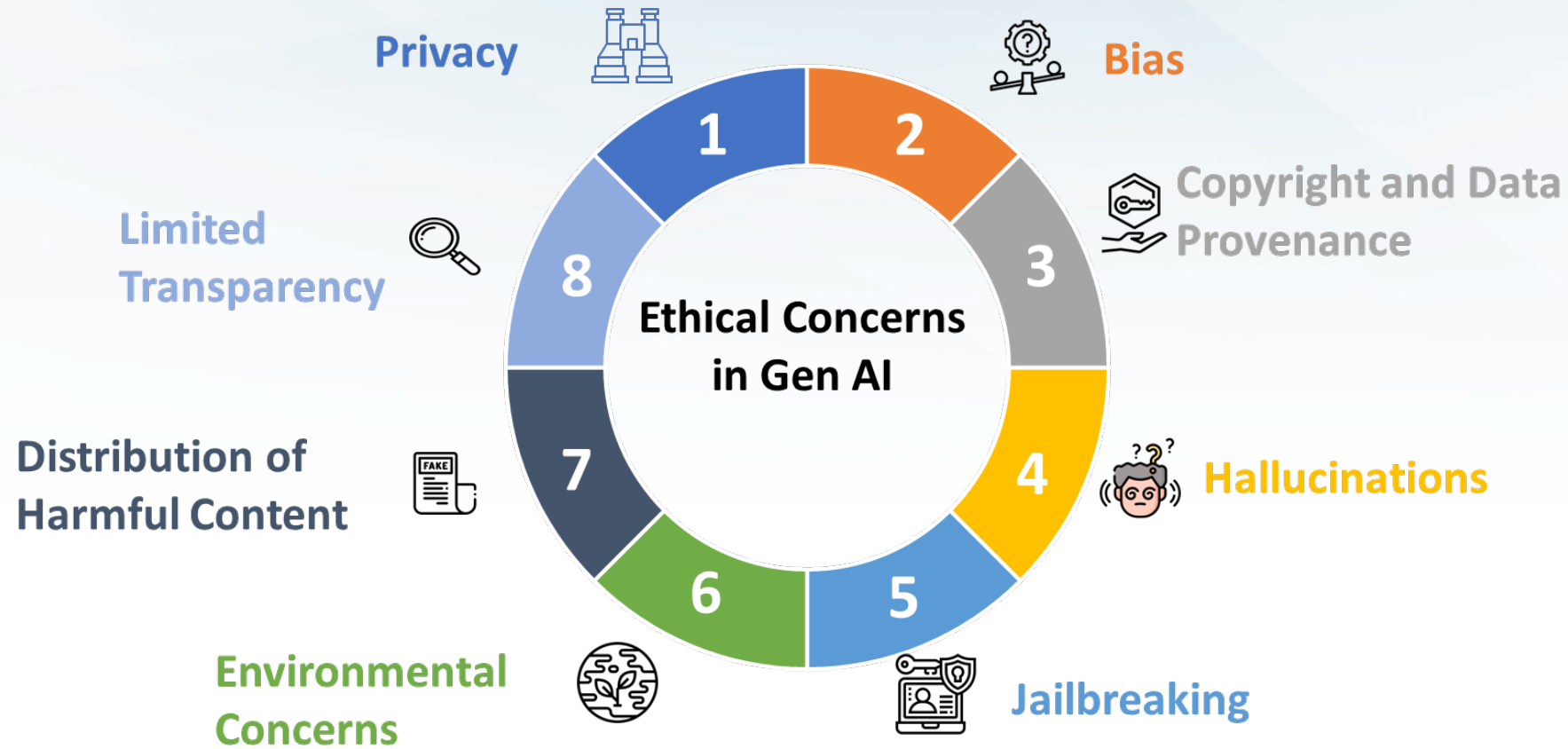
Gen AI Tool	Model	Input	Output
ChatGPT	GPT-4o	\$5 /1M Tokens	\$15 /1M Tokens
Google Gemini	Gemini 1.5 Pro	\$3.5 /1M Tokens	\$10.50 /1M Tokens
Claude	Sonnet 3.5	\$3 /1M Tokens	\$15 /1M Tokens
Perplexity	llama-3-sonar-large-32k-chat	\$1 /1M Tokens	\$1 /1M Tokens

Monthly Individual Subscription Fees:

- ChatGPT - \$20
- Google Gemini - \$20
- Claude - \$20
- Perplexity Pro - \$ 20

Discuss AI Ethics and Implications

Ethical Challenges in Gen AI



Discuss Gen AI Use Cases for Higher Education

Examples of Gen AI Use Cases for Higher Ed.

Instructor Use Cases

- Course Content, Lesson Plans, Assessments
- Quizzes
- Student Engagement
- Language Acquisition

Student Use Cases

- Research
- Brainstorming
- Tutoring Assistance
- Coding / Writing

Administration Use Cases

- Efficiency
- Documentation
- Presentation
- Summarization of meeting notes/emails

Business & IT Use Cases

- Analysis - Finance, HR...
- Brainstorming
- Marketing Content
- Tech Planning & Coding Assistance

Hands-on Activities

Text to Text

- Chat GPT
- Google Gemini
- Claude
- Perplexity

Text to Audio

- Stableaudio
- Suno
- Murf
- Soundful

Text to Images

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- Runway ML

Text to Video

- Invideo
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- Pictory

Hands-on Exercise – Text-To-Text

Gen AI Tools: ChatGPT, Google Gemini, Claude, Perplexity

1. Can you get the latest news of today?
2. Did the cauldron malfunction in any Summer Olympics Games?
3. Make a driving itinerary for 7 days from Calgary to Jasper and back to Calgary. It should include, rental car, overnight lodges recommendation, things to do - hiking trails, scenic drives, and other nature things to do. Output in a table format, including daily driving, hiking distances. Include things around Jasper, Lake Louise and Banff National Park.
4. What sentiment score would you give the following review: The brightness of the lights is wonderful. They arrived late but were a great price.
5. I am a new computer tutor at a community college. I will be assisting students in their homework regarding different programming languages. I would like you to explain me how to write a code in Java for a number 5 factorial.
6. Can you convert the codes in C++ and Python and explain it also. (Follow up in other languages)

Hands-on Exercise – Text-To-Image

Gen AI Tools: Google Gemini, Microsoft Co-pilot / Dalle, Runway ML, Claude, Perplexity

1. Create an image of flamingos flocking around the lake.
2. Create a logo for a Computer Educators Association in Texas which is celebrating 50 years.
3. Create an image of a mountain trekker who is almost reaching Mount Everest Summit and ready to install the flag of USA at the summit. He is excited, joyous and celebrating with couple of climbers who just reached the summit before him.

Hands-on Exercise – Text-To-Audio

Gen AI Tools: stableaudio.com, suno.com, murf.ai

1. Format:Solo|Instrument:Saxaphone |Genre: Jazz|Sub-genre:Chillout|Moods: Romantic|Styles: Film Instrumental|Tempo:Building|BPM:100 (This prompt sequence is best for stable audio)
2. An upbeat jazz instrumental music. Tempo builds as the music goes. Mood is very somber initially and then exciting about life.
3. Muft.ai - Upload some text. Then select the language and then select the AI narrator. It will convert text into audio.

Hands-on Exercise – Text-To-Video

Gen AI Tools – Invideo, Runway ML, Sora

1. Create a video of flamingos flocking around the lake. Some are flying over the lake water and reflections on the water. In the background, sun is setting with the sun reflecting in the lake water and beautiful dusk colors brightens the sky.
2. Create a video of a mountain trekker who has reached Mount Everest's Summit and ready to install the flag of USA at the summit. He is excited, joyous and celebrating with couple of climbers who just reached the summit before him.

Prompt: A stylish woman walks down a Tokyo street filled with warm glowing neon and animated city signage. She wears a black leather jacket, a long red dress, and black boots, and carries a black purse. She wears sunglasses and red lipstick. She walks confidently and casually. The street is damp and reflective, creating a mirror effect of the colorful lights. Many pedestrians walk about.

<https://cdn.openai.com/sora/videos/tokyo-walk.mp4>

Prompt: Drone view of waves crashing against the rugged cliffs along Big Sur's Garay Point beach. The crashing blue waters create white-tipped waves, while the golden light of the setting sun illuminates the rocky shore. A small island with a lighthouse sits in the distance, and green shrubbery covers the cliff's edge. The steep drop from the road down to the beach is a dramatic feat, with the cliff's edges jutting out over the sea. This is a view that captures the raw beauty of the coast and the rugged landscape of the Pacific Coast Highway.

<https://cdn.openai.com/sora/videos/big-sur.mp4>

Prompt: A movie trailer featuring the adventures of the 30 year old space man wearing a red wool knitted motorcycle helmet, blue sky, salt desert, cinematic style, shot on 35mm film, vivid colors.

<https://cdn.openai.com/sora/videos/mitten-astronaut.mp4>

Explore Your Own Use Case for Classroom

Define your higher education use case, and explore implementing it with different Gen AI tools

Example:

I am instructor at community college. Attached are the grades in Excel format of my class. The grading scale is at the bottom with the heading - grading scale. Can you write letters to each student on how they are doing in this class and encourage students who are making overall grade - D and F. (Need to upload the Excel file).

Open Discussion

THE NATIONAL INFORMATION TECHNOLOGY INNOVATION CENTER

Thank You!

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